Geophysical Research Abstracts
Vol. 16, EGU2014-6273, 2014
EGU General Assembly 2014

Modelling of groundwater recharge and drought statistics within the framework of a climate impact study in a Mediterranean catchment (Thau Lagoon, France)

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According to current climate projections until the year 2100, Mediterranean countries are likely to be at high risk for decreasing groundwater recharge during the hydrological winter half year as well as increasing drought severity and duration during summer. Thus, the irrigation needs of agricultural land might increase during the vegetation period and will have to be covered regionally specific partially from groundwater resources. This issue seems to be equally important to be investigated compared to the possible future change of the river discharge regime under changed climate conditions.

Within the framework of the EU-founded CLIMB project (Climate Induced Changes on the Hydrology of Mediterranean Basins) the water balance model mGROWA (Herrmann, 2013) was applied in order to simulate the water balance within the Thau Lagoon catchment (France) under present and possible future climate conditions. The model was originally developed in order to simulate actual evapotranspiration and runoff components (e.g. groundwater recharge) in daily time-steps and with high spatial resolution (50 m grid). Area-differentiated groundwater recharge and soil water content can be simulated consistently using mGROWA because of an integrated multi-layer soil water module. In the framework of CLIMB, this module has been extended by routines to calculate drought statistics.

The mGROWA-model will be briefly introduced and its application to the Thau Lagoon catchment will be presented. At first water balance was simulated for the reference period (1995-2010) based on observed climate data. Special attention will be paid to the simulated temporal variable water content in the root zone and thus to percolation water fluxes and drought statistics. Second, a possible bandwidth of future groundwater recharge (until 2070) is forecasted using climate data from a Regional-Climate-Modell-ensemble (RCM; Deidda, 2013). Three of the four RCM-mGROWA combinations indicate decreasing groundwater recharge up to 25 mm/a until 2070 compared to the reference period 1971-2000, whereas one RCM-mGROWA combination projects a nearly constant level of groundwater recharge for the future. The calculated drought indices however indicate that the frequency and duration of droughts will increase until 2070.

References:

Deidda R., M. Marrocu, G. Caroletti, G. Pusceddu, A. Langousis, V. Lucarini, M. Puliga, and A. Speranza (2013), Regional climate models' performance in representing precipitation and temperature over selected Mediterranean areas, Hydrology and Earth System Sciences, 17, 5041–5059, doi:10.5194/hess-17-5041-2013

Herrmann, F., Chen, S., Heidt, L., Elbracht, J., Engel, N., Kunkel, R., Müller, U., Röhm, H., Vereecken, H., Wendland, F., 2013. Zeitlich und räumlich hochaufgelöste flächendifferenzierte Simulation des Landschaftswasserhaushalts in Niedersachsen mit dem Model mGROWA. Hydrologie und Wasserbewirtschaftung, 57(5): 206-224.